

Does Size Matter? Economies Of Scale In The Banking Industry

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ABSTRACT

This study uses 2007 data from more than 1,200 banking institutions to examine the relationships among size, costs, and profitability in the banking industry. Our results suggest that the relationship between size and firm performance is complex. We find that while costs decline and profitability increases as bank size increases, these relationships do not hold indefinitely and diseconomies of scale are experienced by larger banks. When size is measured by total assets, larger banks begin to encounter lower levels of net income, but the very largest banks are able to enjoy net income that increases at an increasing rate as size increases. When size is measured by total deposits, net income increases at an increasing rate for a wide range of bank sizes and only begins to decrease for the largest banks. Regardless of the size measure employed, we find that increasing size is associated with higher costs that increase at an increasing rate, inevitably resulting in diseconomies of scale with implications for both theory and practice.

Keywords: Economies of scale; economies of scope; banking

INTRODUCTION

The concept of economies of scale offers a great deal of practical relevance for the management of business firms. If bigger is better - or more precisely - if greater scale leads to lower costs and higher profits per unit, then managers have real incentives to grow their organizations so they can reap the advantages of additional scale. Research has established the existence of scale economies, but many of these studies suggest that, in a wide range of industries, minimum efficient scale, or the level of output or production necessary to operate at the lowest point on the average cost curve, occurs at relatively modest levels of output [Scherer, 1980]. This finding is consistent with much anecdotal evidence suggesting that bigger is better only up to a point, and that beyond that point, additional scale is not associated with greater profitability. Many scholars have focused on the administrative and bureaucratic costs associated with the management of organizations – costs that are especially likely to hinder the realization of economies of scale at large firms that are also highly diversified.

While economies of scale were once widely researched, the pace of research on this topic has slowed considerably in recent decades. Yet, many industries are characterized by the concentration of business activity in a relatively small number of very large firms, and even in these concentrated industries, large firms are merging with or acquiring other large firms to further increase industry concentration. Given these trends toward increasing industry consolidation and concentration, important questions about the relationship between size and profitability, and more specifically what firm size is necessary to achieve minimum efficient scale and how quickly firms begin to encounter decreasing returns to scale, merit further research. Moreover, much of the past research on economies of scale has examined the relationships among firm size, per unit costs, and profitability in the manufacturing sector. Recent decades have seen a profound shift toward the information and service economy, so new research examining economies of scale in these emerging information and service industries is certainly warranted.

The research summarized here examines the relationship between size and profitability in the U.S. banking industry. The banking sector was chosen as the focus of this study because it is a highly important service industry that has seen a great deal of consolidation in recent decades. At the same time, banking in the United States remains a highly fragmented industry, one that is characterized by a wide variety of different-sized banks, from very small

local banks to very large money center banks. Finally, most banks have production functions that are transaction driven, exactly the kind of industry in which significant economies of scale would be expected to exist.

REVIEW OF LITERATURE

To investigate the role of size on profitability in the banking industry, we first look at the literature related to economies of scale in other industries, then at studies that measure the limits to this welcome economic development. Finally, we review some of the research addressing scale economies and diseconomies in the banking industry.

Economies of Scale

Conceptually, economies of scale permit larger firms to produce their products and provide their services at lower average costs per unit than smaller firms [Shepherd, 1979]. As firms produce more, they spread fixed input costs over a larger quantity of output, lowering per unit average costs. This ability to manufacture products and to provide services at a lower average cost should translate directly into higher profits, while also possibly creating significant barriers to entry into any industry in which economies of scale are present [Bain, 1954].

Advantages associated with increasing scale can be derived from a variety of factors [Scherer, 1980]. At the product or service level, expanding firms can invest in specialized and more efficient equipment, machinery, and technology that lower per unit production costs. Firms also have incentives to further improve the speed and efficiency of these resources, efforts that further enhance the efficiency of their production processes and increase output. At the plant level, economies of scale can be derived from expanding the size of individual processing units so that output can be increased, which spreads fixed costs over increased output and results in lower per unit costs. Increasing output also allows production employees to specialize in their tasks and gain proficiency; as a result, increasing scale also produces experience or learning effects, which were observed in airplane manufacturing as early as the 1930s and have since been found to exist in nearly all industry settings [Wright, 1936; Asher, 1956; Rosenberg, 1982]. At the firm level, increasing scale encourages even more specialization, further reducing per unit average costs [Shepherd, 1979].

As noted, economies of scale once were widely researched, and so we have a good deal of empirical findings from past studies on which to draw. Bain's 1954 seminal study of 20 concentrated manufacturing industries in the U.S. documented the existence of scale economies and concluded that the absolute cost advantages enjoyed by larger incumbent firms over potential new entrants into an industry result in barriers to entry. In another classic study, Stigler [1958] used the survivor principle to assess and measure scale economies and found that many industries are characterized by essentially horizontal long-run average cost curves, implying that a very wide range of optimum firm sizes exist in the industries he studied. Studies examining economies of scale are not limited to industries in the United States. Silberston [1972] examined a wide array of manufacturing industries in the U.K. and found significant economies of scale due to increased size as well as to how scale interacts with initial fixed costs, working capital, the specialization of labor, vertical linkages, and the specialization of plant equipment to influence overall firm performance. Another study examining Australian manufacturing industries found a single minimum optimal firm size in many of the industries that were studied, indicating that some of the smaller firms operating below optimum size in these industries were at a disadvantage in terms of absolute cost per unit [Round, 1975]. When taken together, these studies collectively provide strong evidence for the existence of economies of scale in a wide array of industries.

Limits to Economies of Scale

Although much empirical evidence concludes that bigger is better, and that economies of scale do exist in a wide array of industries, the concept of scale also assumes that at a certain point firms cannot grow further and continue to realize decreasing costs. At this point, increasing firm size leads to rising average costs, a concept referred to as diseconomies of scale. Shepherd [1979] provides a comprehensive list of the factors that lead to diseconomies of scale, including fixed factors, administrative and bureaucratic costs, and transportation costs.

Fixed factors include limits on managers and managerial ability. Managers are most efficient with small firms where they are able to manage more intensively and to catch and solve problems quickly, but this ability diminishes with increasing firm size. Furthermore, no economics or business scholar would claim that economies of scale are automatic or occur without considerable management coordination and effort. Thus, the quality of managerial ability and skill is a key factor in determining whether or not a firm realizes economies of scale, and managerial talent will also influence how soon a firm begins to encounter diseconomies of scale [Minitier, 1998].

As for bureaucracy, information flows moving from the bottom to the top of an organization (and vice versa) are inefficient, and data and knowledge will become distorted as they move through the bureaucratic chain of command. Thus, bureaucracy adds direct costs to the firm, reduces the quality of decision-making, and therefore tends to make average costs higher as firm size increases. Arrow [1964] notes that a loss of management control is a common occurrence in large business organizations because of the communication challenges associated with moving information and management directives up and down hierarchical levels. He also highlights the incentives that managers have to distort information or to act in their own, as opposed to their organization's, best interests. McAfee and McMillan [1995] expand on these agency concerns by examining their impact on information flows. They theorize that when people acquire private information, they also gain significant incentives to exploit these informational advantages for their own gain (and at the expense of organizational efficiency and effectiveness), thus causing information flows to become very inefficient.

Finally, transportation costs can also contribute to scale diseconomies. As firm size increases, firms will also often expand their markets geographically, and as this happens, higher transportation costs to reach distant customers can result in higher average costs [Shepherd, 1979]. Nor is this phenomenon limited to manufacturing firms. As retailing and service businesses expand their geographical reach, they may also encounter the need to open additional retail outlets and customer service facilities.

As with economies of scale, considerable empirical evidence also confirms the existence of diseconomies of scale. Canback [2002] used data from more than 700 large U.S. manufacturing firms to confirm his hypothesis that bureaucratic failure increases with firm size and has a negative impact on firm performance. Round [1975], in the earlier-cited study of Australian manufacturing firms that verified the existence of economies of scale in many industries, also found that many of these industries had a maximum optimal firm size, so that firms incur significantly higher costs per unit when they operate beyond this optimal size. In a study examining scale economies in the oil industry, Jensen [1986] concluded that personal incentives (including monetary and nonmonetary compensation) encourage executives to grow their firms beyond their optimal size, supporting one of the main tenets of agency theory, that managers will often advance their own self-interest at the expense of shareholder value. Thus, there is substantial evidence supporting both economies and diseconomies of scale.

Scale Economies and Diseconomies in the Banking Industry

Focusing specifically on the banking industry, studies have confirmed the existence of economies of scale and diseconomies of scale, with the differences in findings most likely due to the different time frames of the studies, the use of different data sets, and the use of different analytic techniques and methodologies. For example, many empirical studies find support for the existence of significant economies of scale in the banking industry. Benston [1972], in a study of commercial banks and savings and loan associations using data from the 1960s, found consistent economies of scale, indicating that larger banks and financial institutions enjoy significant cost advantages. Kim [1986], in a more recent study of scale and scope economies in credit unions in the U.K., analyzed multiproduct cost functions to find that credit unions exhibit modest economies of scale, especially in their mortgage lending and investment activities. Clark [1988], in an extensive review and analysis of the literature on economies of scale in financial institutions published prior to 1988, concluded that smaller financial firms may be at a cost disadvantage compared to larger, more diversified banking firms.

A study of large European banks, specifically large financial conglomerates that offer a wide range of financial services, found that these large firms were more efficient than their more specialized competitors [Vennet, 2002]. Bos and Kolari [2005] found similar results when analyzing data from multibillion dollar banks in both the United States and Europe. Their study suggested that large banks exhibit decreasing costs and increasing profits as

scale increases, and they concluded that geographic expansion of large banks is also associated with efficiency gains. In a more recent study focusing on the production efficiency of financial firms, Bossone and Lee [2004] confirmed the existence of economies of scale among these firms, but also concluded that a wide array of factors, including institutional culture, a bank's risk profile, and market concentration also significantly influence firm performance.

At the same time, many studies have concluded that expanding banks will eventually reach a point where average costs stop decreasing and start to increase. Benston, Hanweck, and Humphrey [1982] modeled a translog cost function to estimate U-shaped average cost curves, and their analysis found that the largest banks face significant diseconomies of scale. In a comparable study, Clark [1996] concluded that the average cost curve for banks is relatively flat with diseconomies of scale found only among the smallest and largest banks. Interestingly, he concluded that an emphasis on reducing costs in the largest banks may actually contribute to poor decision making and increased risk taking. Mitchell and Onvural [1996] concluded that increasing levels of production at large banks is usually cost efficient, but they found that there is relatively little to gain by increasing the scale of production. Thus, their study provides additional confirmation that minimum efficient scale can be achieved in relatively modest-sized banks and that the average cost curve for most banking institutions is relatively flat.

In a study examining the banking industry from a multiproduct point of view, Gilligan, Smirlock, and Marshall [1984] found support for the existence of economies of scope but no evidence of economies of scale or product-specific decreasing costs in the banking industry using data from 1978. In fact, they found product-specific diseconomies of scale. Berger, Hanweck, and Humphrey [1987] similarly found slight diseconomies of scale in the banking industry, which were robust across a wide range of output levels and competitive environments.

Even this brief review of the literature indicates an overwhelming amount of empirical evidence supporting contrasting views on economies of scale in the banking industry. Given the mixed findings of past studies of economies of scale in the banking industry, the continuing merger and acquisition activity that characterizes this industry, and the many ways in which banking firms continue to capitalize on advances in information technology to enhance operating efficiency, additional study of economies of scale in the banking industry, using more recent firm size and performance data, seems warranted.

RESEARCH METHODOLOGY

This section presents our data and the analysis techniques employed to investigate the relationship between size and profitability in the contemporary setting. As stated in the introduction, this study focuses on economies of scale in the U.S. banking industry for two reasons. First, despite a great deal of consolidation through merger and acquisition, the United States banking industry remains highly fragmented and continues to have large numbers of banks of all sizes from the very small to the very large. The sample employed in this study includes all banks in the states of California, Illinois, and New York. This enables us to mirror the universe of U.S. banks by including small banks that typically serve rural areas and small communities, very large "money-center" banks headquartered in Los Angeles, San Francisco, Chicago, and New York, and a vast number of banks between these two ends of the size continuum. A total of 1,214 banking institutions are included in the sample.

Size is measured both by total assets, which includes current (cash and marketable securities) and long-term assets (loans, other investments, and facilities), and by total deposits. Our study examines the relationship between these two size variables and one cost variable, non-interest expense, and one profitability variable, net income. Thus, we are able to observe both how costs interact with bank size as well as how size directly influences overall net income. All data for the study are obtained from the publicly accessible online database maintained by the Federal Deposit Insurance Corporation.

Two separate sets of regression analyses are run. The first examines the relationship between size, as measured by total assets, and the cost and profitability measures. The second set of analyses examines the relationship between the second size variable, total deposits, and the cost and profitability measures. Three separate regression analyses are run for each of the four relationships to determine whether the relationship between size and performance was linear or curvilinear, including:

cost or profitability = $f(\text{size})$
 cost or profitability = $f(\text{size}, \text{size}^2)$
 cost or profitability = $f(\text{size}, \text{size}^2, \text{size}^3)$

While the first of these regression models tests for a linear relationship between size and cost or profitability, the second two models test for the existence of curvilinear relationships between size and performance, and to examine specifically whether performance increases or decreases at an increasing rate beyond some level of scale.

RESULTS

Table 1 summarizes the means, standard deviations, and correlations among the dependent and independent variables. Results of the regression analyses are shown in Tables 2 and 3. Table 2 reports the results of regression analyses using total assets as the size variable, while Table 3 reports the results of regression analyses using total deposits as the size variable.

Table 1: Means, Standard Deviations, and Correlations among the Variables (Means and Standard Deviations Reported in Thousands of Dollars)

	<u>MEAN</u>	<u>STANDARD DEVIATION</u>	<u>CORRELATIONS</u>			
			<u>Net Income</u>	<u>Non-Interest Expense</u>	<u>Assets</u>	<u>Deposits</u>
Net Income	22,202	268,018	1.000			
Non-Interest Expense	49,478	751,974	.983	1.000		
Assets	1,837,184	21,468,424	.996	.982	1.000	
Deposits	1,222,299	14,507,475	.996	.993	.994	1.000

As summarized in Tables 2 and 3 on the following page, our study reveals an interesting set of relationships between bank size, as measured by total assets, and net income and non-interest expense. The first column of Table 2 suggests a strong linear relationship between total assets and net income. The second column further supports this finding, and suggests a curvilinear relationship between size and net income with net income increasing at an increasing rate as size increases. The third column suggests however, that net income increases as smaller banks increase in size, but that these increases then cease. Finally, net income again increases at an increasing rate among the largest banking companies.

Columns 4, 5, and 6 of Table 2 summarize the relationship between total assets and non-interest expense. As expected, column 4 indicates that costs rise in a linear fashion as size increases. Columns 5 and 6 suggest, however, that costs rise at an increasing rate for larger banks, and increase at an even faster rate among the very largest banks. These findings suggest that the larger and the largest banks encounter significantly higher non-interest expense and experience diseconomies of scale.

Table 3 on the following page replicates these analyses using total deposits as the size measure, and both analyses of the relationship between total deposits and net income and between total deposits and non-interest expense suggest that banks encounter significant diseconomies of scale. The first column of Table 3 suggests a strong linear relationship between total deposits and net income. The second column however, shows that as total deposits increase, net income decreases. The third column indicates, however, that net income increases as smaller banks increase in size and that this relationship accelerates as banks increase in size, but, as banks become very large net income declines at an increasing rate.

Columns 4, 5, and 6 show the relationship between total deposits and non-interest expense. Column 4 indicates that costs rise in a linear fashion as size increases. Columns 5 and 6 suggest that these costs increase at an increasing rate as bank size increases. Note that the coefficient of the cubic term in Column 6 is negative, but that it is not statistically significant.

Table 2: Results of Regression Analyses, Size Measured as Total Assets (t-statistics Reported in Parentheses)

	<u>Net Income</u>	<u>Net Income</u>	<u>Net Income</u>	<u>Non-interest expense</u>	<u>Non-interest expense</u>	<u>Non-interest expense</u>
Intercept	-649.920 (-0.98)	-101.628 (-0.15)	-1473.193* (-2.26)	-13,690.100*** (-3.31)	5751.941* (2.30)	-4870.030* (-2.33)
Assets	0.012*** (405.72)	0.012*** (115.27)	0.014*** (59.75)	0.034*** (179.10)	0.017*** (43.14)	0.034*** (44.52)
Assets²		7.73E-13*** (4.98)	-2.87E-11*** (-9.92)		2.71E-11*** (46.81)	2.00E-10*** (-21.60)
Assets³			3.71E-20*** (10.20)			2.87E-19*** (24.60)
F	164,610.0***	83,934.0***	60,751.5***	32,078.5***	46,093.9***	46,246.7***
R²	.993	.993	.993	.982	.987	.991
* p < .05						
** p < .01						
*** p < .001						

Table 3: Results of Regression Analyses, Size Measured as Total Deposits (t-statistics Reported in Parentheses)

	<u>Net Income</u>	<u>Net Income</u>	<u>Net Income</u>	<u>Non-interest expense</u>	<u>Non-interest expense</u>	<u>Non-interest expense</u>
Intercept	-280.805 (-0.39)	-2409.338*** (-3.64)	-926.224 (-1.40)	-13,408.500*** (-5.09)	-140.228 (-0.08)	199.483 (0.11)
Deposits	0.018*** (371.56)	0.021*** (122.03)	0.018*** (40.88)	0.051*** (284.39)	0.034*** (71.49)	0.033*** (27.20)
Deposits²		-6.257E-12*** (-16.81)	8.41E-11*** (8.31)		3.90E-11*** (71.49)	5.97E-11* (2.10)
Deposits³			-1.71E-19*** (-8.93)			-3.90E-20 (-0.73)
F	138,056.0***	85,195.3***	60,514.7***	80,875.0***	90,557.3***	60,348.3***
R²	.991	.993	.993	.985	.993	.993
* p < .05						
** p < .01						
*** p < .001						

DISCUSSION AND IMPLICATIONS

This study uses data from 2007 – recent, but before the disruptions of the recent Great Recession – to re-examine the relationships among size, costs, and profitability at a large sample of banks. Given the considerable merger and acquisition activity that has occurred in this industry and the continued application of information technology to banking activities, a new study to test for the existence of scale economies and diseconomies in the banking industry was warranted. Our results suggest that the relationship between size and firm performance is complex. While we find that costs decline and profitability increases as bank size increases, these relationships do not hold beyond some fairly modest size. Profitability begins to decline as bank size increases. When size is measured as total assets, medium-sized banks appear to suffer performance declines, while the very largest banks

enjoy sharply higher levels of net income. When size is measured by total deposits, very large banks experience declining levels of net income. On the cost side, as size increases, costs increase at an increasing rate, regardless of the size variable used in the regression analyses.

Our study offers certain implications for the theoretical understanding of economies of scale. Many past studies have confirmed the existence of both economies of scale and diseconomies of scale in the banking industry. Our study, using recent banking industry data, offers additional empirical support for these findings. Given the extremely wide range of banks, from very small banks to very large banks (the smallest bank in our sample had total assets of just \$4 million while the largest had total assets of over \$700 billion), it's quite likely that the banking industry is characterized by significant economies of scale that begin to be realized with fairly modest increases in firm size, followed by a wide range of bank sizes that are characterized by an essentially horizontal average cost curve, with only the largest banks beginning to encounter higher average costs (and lower profitability). Such speculation is not only consistent with Stigler's [1958] early study of economies of scale but also many, more recent studies of economies of scale that focus specifically on the banking industry [Benston et al., 1982; Berger et al., 1987; Clark, 1996; Mitchell and Onvural, 1996]. In any event, our study offers empirical evidence of the existence of significant diseconomies of scale that begin to manifest themselves as banks become very large.

The current study also suggests close inspection of management practices. Our findings can hardly be considered definitive, but they do suggest that bigger is not always better in terms of costs and profitability. While our results suggest that increases in size are initially associated with lower costs and greater profitability, these advantages do not continue as bank size continues to grow. In particular, regardless of whether size is measured as total assets or total deposits, costs increase at an increasing rate as size increases. It is well beyond the scope of this study to determine whether increasing costs are due to administrative, bureaucratic, and informational inefficiencies or to some other factor or set of factors. Most likely, no one single factor or set of factors is responsible for the diseconomies of scale encountered by the banking companies in our sample.

While this study cannot diagnose the source of diseconomies of scale, the study does support the view that firms in the banking industry enjoy significant economies of scale up to a point, and that at some point as banks become much larger, they begin to incur higher costs that increase at an increasing rate and translate into lower levels of profitability. Perhaps the most important strategic implications to be drawn from our findings are that banks can reap the benefits of scale, but that these benefits do not continue indefinitely and that, beyond some point, increasing scale can be detrimental to firm performance.

CONCLUDING REMARKS

Continued consolidation is almost certainly inevitable in the banking industry. Our study's findings that confirm the existence of significant diseconomies of scale are probably most applicable and worthy of concern in situations where very large banks plan acquisitions of other very large banks. Our findings suggest that in these situations, costs might accelerate most quickly, harming overall firm performance.

Since the recent Great Recession, much public policy debate has focused on weaknesses in the banking and finance sectors of our economy and the need for greater government regulation of banks and other financial institutions. Enough prior research has confirmed the existence of diseconomies of scale to suggest that bigger is not always better in terms of bank size [Bollenbacher, 1992]. Financial rescues and government bailouts of banks during the economic crisis raised questions about whether some banks are too big to fail and, if that is the case, whether even greater regulation, oversight, and limits on bank size are needed. While we would caution that our findings should probably not be the basis for public policy decisions, they do suggest that we should be concerned about the efficiency and effectiveness of the very largest banking companies and that we might, with good reason, question the appropriateness of very large banks merging with or acquiring other very large banking institutions.

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